

The Livestock Waste Control Scheme :

Guidelines for Soakaway System

INTRODUCTION

Following the implementation of the Livestock Waste Control Scheme in 1988 and the revised Livestock Waste Control Scheme in 1994, livestock farmers in Livestock Waste Control and Restriction Areas must comply with control requirements in the management and disposal of livestock waste. A soakaway system is a viable and practical option for waste treatment when a small quantity of wastewater is generated from the livestock keeping operation. The effectiveness of the soakaway system is thus a very important element in the on-farm management of livestock waste. These guidelines are prepared with a view to providing livestock farmers and waste treatment system designers with general information on the provision of a soakaway system for the abatement of pollution caused by livestock waste. It should be noted that it is an offence under the Waste Disposal Ordinance (WDO) to allow a soakaway system to overflow. An offence under the WDO may constitute a violation of other legislation (including the Water Pollution Control Ordinance, the Public Health and Municipal Services Ordinance and the Waterworks Ordinance, etc.).

The installation of a soakaway system in a farm is not always feasible, especially for pig farms, and its suitability is affected by the following factors:

- (a) Size of farm operation (and the amount of wastewater generated)
- (b) Amount of solids in the wastewater
- (c) Permeability of the soil
- (d) Level of underground water table
- (e) Site topography
- (f) Site location (and the distance from watercourses etc.)
- (g) Availability of land area

Before adopting a soakaway system, a responsible farm operator must carefully evaluate the above factors and organize a site percolation test to ascertain whether the soil at the farm is suitable for a soakaway system. A simplified procedure for carrying out the site percolation test is given in para v(b).

THE SOAKAWAY SYSTEM

A soakaway system normally includes screens, a catch pit, a septic tank, soakaway pit and trenches, and the associated dung channels. Farms which can achieve very high levels of dry removal of solid waste, and low levels of water use (ie. chicken and small duck farms), will not normally require septic tanks. Septic tanks will invariably be required for pig farms where any effluent is generated. Figure 1 below is a schematic diagram showing the general arrangement of the components of a soakaway system.

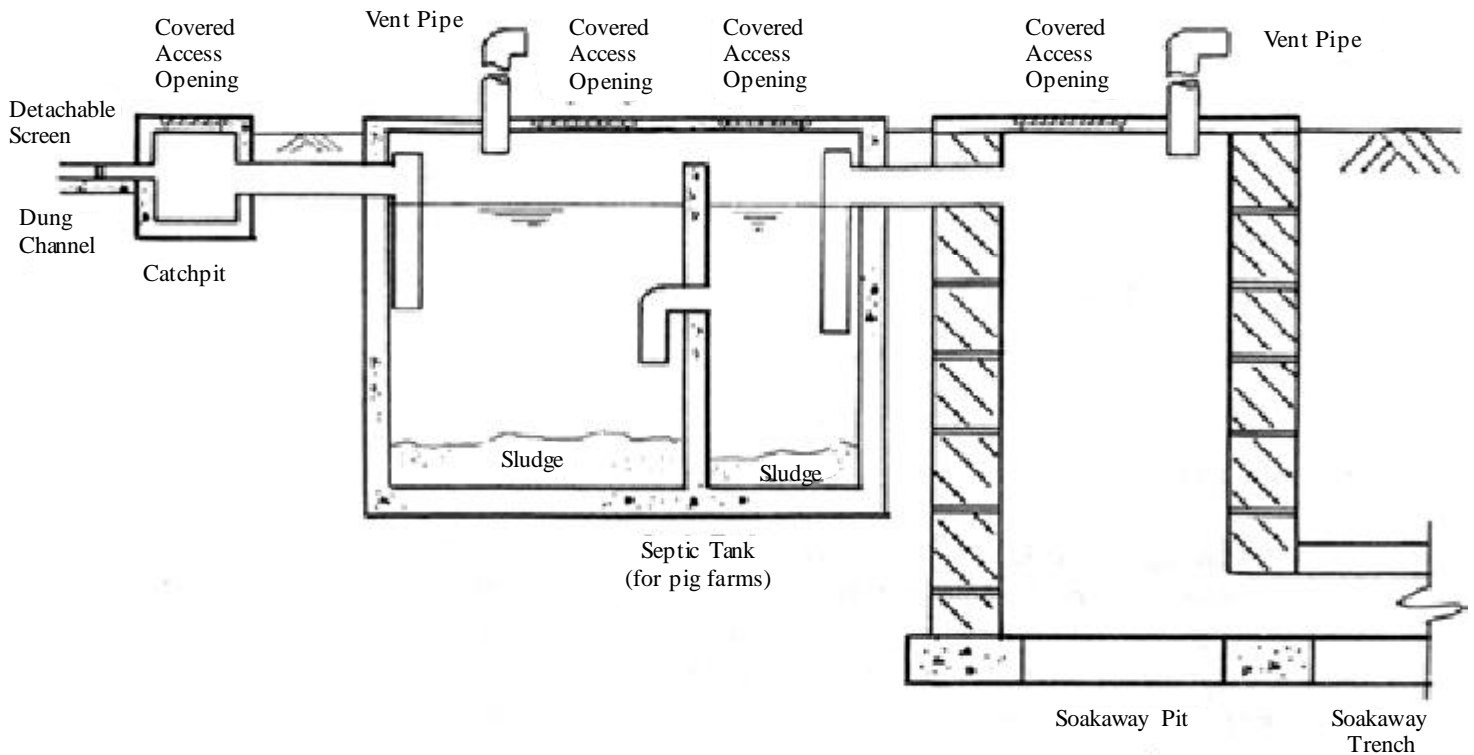


Figure 1 The General Arrangement of Components of a Soakaway System

The general components of a soakaway system are described below:

i) Dung Channel

Purpose : To collect and convey wastewater to the inlet of the catch-pit.

Design Considerations:

- (a) Sufficiently wide to facilitate periodic maintenance.
- (b) Sufficient gradient to enable self cleansing.
- (c) Prevention of rainwater ingress and overflow.
- (d) Fitted with screening gear to enable the removal of solids.

Maintenance Requirement: Settled/ screened solids and fallen leaves in the dung channels should be removed after every washing of livestock structures, and be properly disposed of in accordance with the Code of Practice for Livestock Waste Management.

ii) Screen

Purpose : To remove suspended solids and coarse matter in the wastewater.

Design Considerations:

- (a) Openings should be sufficiently small to retain the solids but large enough to allow the wastewater to pass through.
- (b) Screenings can be easily removed on a regular basis.

Maintenance Requirement: Periodic removal of screenings and cleaning.

iii) Catch-pit

Purpose : To collect wastewater from dung channels and to facilitate removal of solid matters.

Design Considerations:

- (a) Sufficiently large to prevent overflows.
- (b) Enable screening of solids and grits.
- (c) Provision for emptying solids and grits.
- (d) Covered to prevent ingress of rainwater.

Maintenance Requirement: Removal of trapped solids and grits after every washing or hosing down operation.

iv) Septic Tank

Purpose: To facilitate sedimentation and decomposition of small solid particles. (Septic tanks are normally not required for poultry farms because dry muck-out at poultry farms can achieve very high levels of solids removal. Soakaway pits/trenches are however necessary.)

Design Considerations:

- (a) Sufficiently large to provide a minimum capacity for 3 days' storage of wastewater, and to hold all the sludge likely to accumulate between desludging. The required size is therefore determined by the amount of water used during washing, the solids content of the wastewater entering the tank (and therefore the amount of solids remaining after dry muck-out) and the frequency of desludging. Table 1 illustrates how the required capacity for a pig farm can be affected by different operational practices. For example, if the amount of water used in a pig farm is 15L/pig/day, with 80% of solids removed during dry muck-out, and the tank is desludged once every 3 months, the required capacity is about 0.15m³ per pig. Nevertheless, a septic tank should not be smaller than 2.5m³ to enable ease of maintenance.
- (b) Well vented with a vent pipe to avoid accumulation of methane or other obnoxious gases.
- (c) Leak-proof.
- (d) Covered to prevent external deposition of solids or ingress of rain.
- (e) Access for mechanical desludging.

Table 1 Size of Septic Tank for Pig Farms with Different Operational Practices

Quantity of washwater used (L/pig/day)	Desludging interval (month)	Septic tank size (m ³ / pig) for different percentage removal of solids during dry muck-out		
		70%	80%	90%
15	3	0.20	0.15	0.10
	6	0.35	0.25	0.15
10	3	0.18	0.13	0.08
	6	0.32	0.23	0.13
5	3	0.16	0.11	0.07
	6	0.30	0.21	0.11

Maintenance Requirement: Periodic sludge removal, at least once every 6 months but once every 3 months is normally expected.

v) The Soakaway Pit/Trench

Purpose : Percolation of wastewater to surrounding subsoil.

Design Considerations:

- (a) Soakaway pit should be sufficiently large to avoid flooding and overflow. The minimum capacity of the pit should accommodate all the wastewater produced during one washing or in one day, whichever figure is the greater.
- (b) Permeability of Soil. If the percolation rate is too high, the wastewater might drain into the nearby watercourses before any effective treatment. If it is too low, the pit/trenches might soon clog up and wastewater would overflow. A site percolation test should be conducted to determine the soil permeability. Table 2 illustrates the maximum allowable loadings of soakaway pits and trenches. The common simplified procedures of percolation test for determining the absorption capacity of soil are given below:
 - Excavate a hole 300mm square to the proposed depth of the pit and trench.
 - Fill the hole with approximately 150mm of water and allow it to seep away completely; no need to measure the time.
 - Refill the hole with water to a depth of 150mm and observe the time, in minutes, for water to seep completely away.

Table 2 Soakaway Area Requirements at Different Soil Percolation Rates

Time for water to fall 150mm in test pit (minutes)	Required trench bottom area (m²) per 1,000L/day of wastewater	Required pit percolation area (m²) per 1,000L/day of wastewater
6 or less	31	23
12	38	29
30	51	38
60	72	53
180	152	111

Note

1. This table is only applicable to small inland duck farms or those poultry or pig farms intending to carry out dry muck-out of livestock waste.
2. A septic tank is required for pig farms.

(c) **Sufficient Soakaway Area.** A reasonable percolation rate which is neither too high nor too low is about 60 minutes for water to fall 150mm. With such a percolation rate, a pig farm using 15L/pig/day of washwater and removing 80% of solids during dry muck-out requires a minimum soakaway trench area of 0.9m² for every pig (ie. 0.75m of trench if it is 1.2m wide). Table 3 illustrates how this requirement can be affected by differing operational practices. For a chicken farm using 0.4L/chicken/week of washwater and achieving 97% removal of solids, a minimum of about 0.4m² of trench is required for every 100 chickens (ie. 0.33m of trench if it is 1.2m wide). Table 4 illustrates how this requirement can be affected by different operational practices. Similarly, a duck farm generating 1,000L/day of wastewater requires 72m² of trench (ie. 60m of trench if it is 1.2m wide). Table 2 illustrates how this requirement can be affected by different soil percolation rates.

Table 3 Soakaway Trench Area Requirement for Pig Farms with Different Operational Practices

Percentage removal of solids during dry muck-out	70%	80%	90%
Minimum soakaway trench area requirement (m²/pig)	1.1	0.9	0.7

Note

The above is based on

1. a soil percolation time (rate) of 60 minutes for water to fall 150mm (NB. the trench area requirement may be reduced if the percolation rate is increased, pro rata to the requirements shown in Table 2; on the other hand, the trench area would need to be increased if the percolation rate is slower.);
2. a septic tank is provided; and
3. a washwater usage rate of 15L/pig/day. (NB. the trench area requirement can be reduced slightly by reducing the amount of washwater used.)

Table 4 Soakaway Trench Area Requirement for Chicken Farms with Different Operational Practices

Quantity of washwater used per wash (L/chicken)	Wash Interval (day)	Minimum soakaway trench area (m ² /100 chicken) for different percentage removal of solids during dry muck-out		
		95%	97%	99%
0.4	3	0.70	0.46	0.22
	7	0.64	0.40	0.16
	28	0.61	0.37	0.13

Note

The above is based on a soil percolation time (rate) of 60 minutes for water to fall 150mm. (NB. the trench area requirement may be reduced if the percolation rate is increased, pro rata to the requirements shown in Table 2; on the other hand, the trench area requirement would need to be increased if the percolation rate is slower.)

- (d) A soakaway pit or trench should be located sufficiently far away from building foundations, watercourses and wells, in order to safeguard public health and maintain the structural integrity of nearby buildings. A safe distance is generally 30m from watercourses and wells, and 3m from structures.

Maintenance Requirement : Periodic removal of any sludge accumulated.

GENERAL PRECAUTIONS

For effective performance of a soakaway system, the following general principles should be adhered to:

- (a) Check and clean up dung channels, screens and catch pits everytime before hosing out waste residues.
- (b) Prevent overflow throughout the system. This may be achieved through proper design (eg. units should be of sufficient capacity and capability), construction and maintenance (eg. regular desludging). Allowing overflow to occur would result in prosecution.
- (c) Keep vehicles off soakaway areas.

OTHER INFORMATION

There are altogether five sets of similar guidelines in Chinese and English available free of charge from the Environmental Protection Department:

- (a) Guidelines for Dry Muck Out of Livestock Waste;
- (b) Guidelines for Wet Muck Out and Hybrid Systems;
- (c) Guidelines for Soakaway System;
- (d) Guidelines for the Management of Livestock Waste Arising from Free-range Poultry Keeping; and
- (e) Guidelines for Litter Bedding Method for the Treatment of Livestock Waste.

